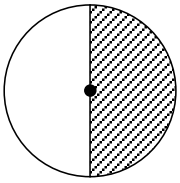
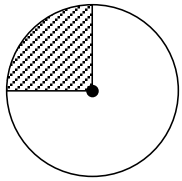
6-52. Find the area of each shaded portion, called a **sector**, in the circles below.

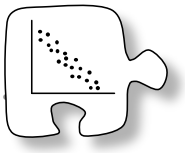
a. The diameter is 3 feet.



b. The radius is 12 ft.



6.1.6 When does a graph make a straight line?



Tables, Linear Graphs, and Rules

In the previous lesson you made a graph showing how the water level in a tank changed as it was being drained at a constant rate. You noticed that the graph made a straight line. Today you will complete a table and graph what happens as the Giant Pacific Octopus tank is being filled. As you work with your team, think about the following questions:

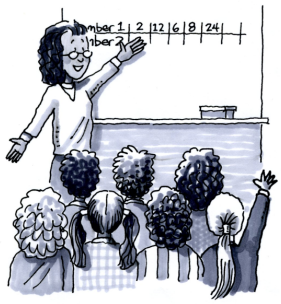
How is the line changing?

What information can we get from a rule?

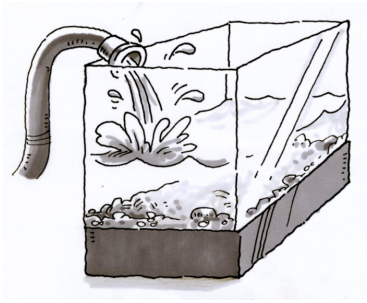
When does a graph form a straight line? When does it not?

6-53. SILENT BOARD GAME

Today you will continue to play the Silent Board Game. Your teacher will put an incomplete $x \rightarrow y$ table on the overhead or board. Study the input and output values and look for a pattern. Then write the rule in words and symbols that finds each y-value from its x-value.



6-54. CLEANING THE TANK, Part Two



Today Roland and Alli are filling the 20-foot deep octopus tank from problem 6-43. The tank started empty and began filling earlier in the day. When Alli got to work the water level was up to 8 feet. It is being filled at a constant rate of four feet per hour. Alli created the table below. She wants to use a data table to predict when the tank will be full so that she will know when to shut off the water.

x (hours after Alli arrived)	–2	–1	0	1	2	3	x
y (height in feet)			8				$y =$

a. Copy and complete Alli's table on your own paper. Then graph the data on graph paper. Be sure you have a complete graph.

b. What will the height of the water be two hours after Alli gets to work?

c. How long before Alli got to work did the tank begin to be filled? How do you know?

d. How many hours after she got to work did Alli need to turn the water off because the tank was full?

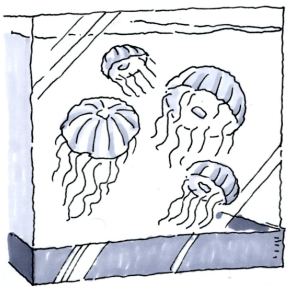
e. The table is set up like a Silent Board Game. What is the rule that describes the data in this table?

6-55. Looking at the x-intercept and the y-intercept on a graph can help you tell the story of the data.

a. What are the coordinates of the x-intercept and what information does that point tell you about the water in the tank?

b. What are the coordinates of the y-intercept and what information does that point tell you about the water in the tank?

6-56. CLEANING THE TANK, Part Three



The next day Alli started her day's work at the jellyfish tank that had been cleaned the day before and was now being refilled. There, she found a 30-foot deep tank that had four feet of water in it. Alli started filling the tank so that after x hours, the water level was $y = 3x + 4$ feet high. Alli knew she could only work for seven hours that day. After four hours she began to worry that the tank would not be full before she had to leave.

a. Using the rule, complete the table and then graph the height of the water in the tank for the first four hours that Alli was at work.

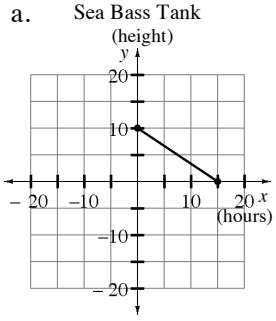
x (hours)	0	1	2	3	4	x
y (height)						$y = 3x + 4$

b. Based on your graph, will the tank be full when Alli has to leave work? If not, how many feet of water still will be needed to fill the tank?

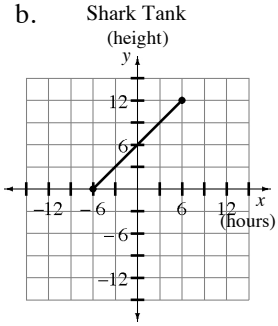
c. What is the y-intercept and what does this point tell you about this situation?

6-57. Look at the following graphs and tell what is happening at each tank. Think about whether the tank is filling or draining and what the x- and y-intercepts tell you. Be specific about the water level in the tank.

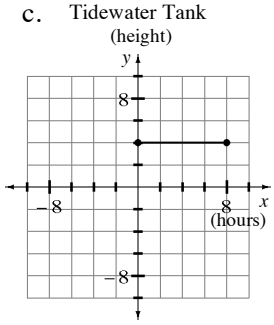
a. Sea Bass Tank



b. Shark Tank



c. Tidewater Tank



6-58. Complete the table below and draw a graph of the rule $y = -3x + 18$. Check that your points form a straight line and correct any errors.

x	–3	0.5	–1	6	1	0	3	–2	5
y			21		15				

MATH NOTES

METHODS AND MEANINGS

When is a Point on the Graph of a Rule?

So far you have drawn several graphs by starting with a rule, substituting x-values, computing y-values, and plotting the points on a set of axes. What if you have the coordinates of a point and want to know if it also belongs on the graph? Use the rule and determine whether the point makes the equation true or false. If the point makes the equation true, it is also on the graph; if it is false, it does not belong on the graph. Here are two examples:

Is $(10, 25)$ on the graph of $y = 2x + 5$?	Is $(5, -3)$ on the graph of $y = -2x - 7$?
Replace x with 10 and y with 25 and determine if the equation is true or false.	Replace x with 5 and y with -3 and determine if the equation is true or false.
Is $25 = 2 \cdot 10 + 5$?	Is $-3 = -2 \cdot 5 - 7$?
$25 = 25$ so yes, the point is on the graph.	$-3 \neq -17$ so no, the point is not on the graph.

6-59. Make a table and a graph for the following rule: $y = 2x - 4$.

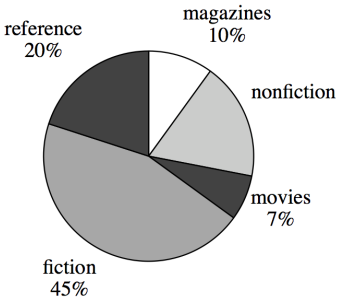
a. Explain how you know that there are more points than just the ones shown on your graph.

b. Where would the additional points go on the graph?

6-60. Determine if each of the numbers below is a solution to the inequality $3x - 2 < 2 - 2x$. Show all of your work.

a. 2 b. $\frac{1}{2}$ c. -3 d. $\frac{2}{3}$

6-61. The school library has 6500 titles in its collection of books, magazines, and reference materials. The librarian is presenting information about the library to the parent association, and she made the graph at right.



a. According to the graph, what percentage of the collection are nonfiction books?

b. Could the librarian have presented this information in a histogram? Why or why not?

c. How many of the books in the library are fiction?

6-62. Hector has a part-time job at a garage. He gets a paycheck of $820 every four weeks.

a. Hector has to pay 15% of his income in taxes. How much money does he pay in taxes each paycheck? Show your thinking with a diagram and calculations.

b. Hector took a 1-week vacation, so his next paycheck will only be for 3 weeks of work. What percentage of his regular pay should he expect to receive? How much is that?

c. The garage owner is impressed with Hector's work, and is giving him a 10% raise. How much will Hector be paid when he receives his next 4-week paycheck?

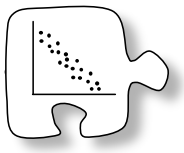
6-63. An NBA basketball hoop has an inside diameter of 18 inches. The official NBA basketball has a maximum circumference of 30 inches. What is the difference between the hoop diameter and the diameter of the ball? Show all of your work.

6-64. Red apples cost $1.20 per pound and green apples cost $1.50 per pound.

a. Write an expression to represent the total cost of x pounds of red apples and y pounds of green apples.

b. What is the total cost if you buy 3 pounds of red apples and 2 pounds of green apples?

Extension Activity What is the relationship?



Finding and Describing Relationships

Today you will become a point on a life-size, human graph. Your teacher will give the class instructions for how to form human graphs. Then you will work in study teams to complete the problems below.

6-65. HUMAN DATA POINTS

Can you imagine what it is like to be a point on a graph? Today is your chance to find out. Your teacher will direct you to a set of axes and explain how to stand on the graph. As you are doing this problem, think about the different patterns you see. Is there a relationship between them?

6-66. Your teacher will post the graphs for the points that you and your classmates used to form "human graphs."

a. Compare the graphs. How are they the same and how are they different?

b. Look at the graphs that formed scatterplots. Which graphs show a positive correlation? Negative correlation? Did any graph show no correlation?

c. Were any graphs straight lines? If so, copy the table with all the points next to the graph you made on your resource page. Use the table to find a rule that finds each y-value from its x-value.

6-67. LEARNING LOG

Write a paragraph in your Learning Log that describes what you did and what you observed in today's class work. How were the scatterplots different from the linear graphs? How did you identify which kind of graph you had? Put today's date on your entry and title it, "Human Data Points."

Review & Preview

6-68. Simplify each expression.

a. $\frac{73}{100} \cdot (-\frac{2}{7})$ b. $0.4 \cdot 0.3$ c. $-\frac{63}{80} + \frac{7}{10}$

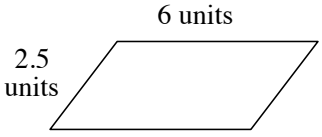
d. $5\frac{1}{9} + 8\frac{2}{5}$ e. $-\frac{9}{17} - \frac{1}{2}$ f. $-1.2 + (-\frac{3}{5})$

6-69. Graph the following points on a coordinate grid and connect them to make a triangle: $(0,1), (3,2), (2,4)$. Then:

- Dilate the shape by multiplying each coordinate by two.
- List the coordinates of the new vertices.

What do you notice about the sides of the two shapes?

6-70. Sketch the parallelogram shown at right, and then redraw it with sides that are half as long.



a. Find the perimeters of both the original and smaller parallelograms.

b. If the height of the original parallelogram (drawn to the side that is 6 units) is 2 units, find the areas of both parallelograms.

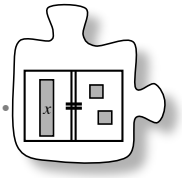
6-71. Simplify each of the following expressions.

a. $32 \div 2 \cdot 4$ b. $3 \cdot 6 \div 2 + 6$ c. $3^2 + 7$

6-72. Use the 5-D Process to solve the following problem.

Jen, Carrie, and Fran are each thinking of a number. When you add their numbers together you get 207. Jen's number is 9 more than Carrie's, and Fran's number is 3 less than Jen's number. What is Fran's number?

6.2.1 What values make expressions equal?



Solving Equations

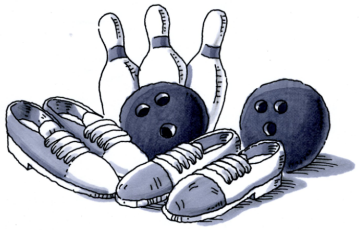
In Chapter 5, you figured out how to determine what values of x make one expression greater than another. In this lesson you will study what can be learned about x when two expressions are equal. As you work today, focus on these questions:

What if both sides are equal?

Is there more than one way to simplify?

What value(s) of x will make the expressions equal?

6-73. CHOOSING A PRICE PLAN



Sandeep works at a bowling alley that currently charges a player $3 to rent shoes and $4 per game. However, his boss is thinking about charging $11 to rent shoes and $2 per game.

a. If a customer rents shoes and plays two games, will he or she pay more with the original price plan or the new price plan? Show how you know.

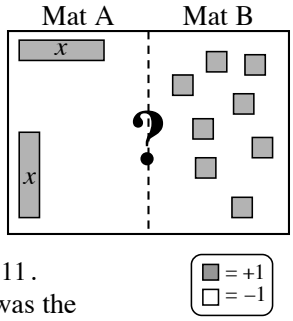
b. If the customer bowls 7 games, which price plan is cheaper?

6-74. WILL THEY EVER BE EQUAL?

Sandeep decided to represent the two price plans (from problem 6-73) with expressions, where x represents the number of games bowled:

Original price: $4x + 3$ New price: $2x + 11$

a. Do his new expressions find the same prices? Find both the original and new prices when $x = 2$ and then again when $x = 7$ games. Did you get the same prices as you found in problem 6-73?



b. Sandeep decided to place his expressions on an Expression Comparison Mat. What steps did Sandeep take to simplify the mat to this point?

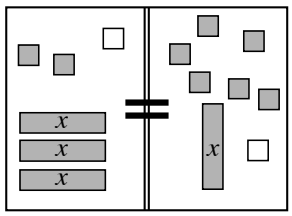
c. Sandeep noticed that for one number of games, a customer would pay the same amount no matter which price plan his boss used. That is, he found a value of x that will make $4x + 3 = 2x + 11$. How many games did that customer bowl? What was the price he paid? Explain.

d. The value of x you found in part (c) is called a **solution** to the equation $4x + 3 = 2x + 11$ because it makes the equation true. That is, it makes both expressions have the same value.

Is $x = 6$ also a solution? How can you tell?

6-75. SOLVING FOR *X*

When the expressions on each side of the comparison mat are equal, they can be represented on a mat called an **Equation Mat**. Obtain a Lesson 6.2.1 Resource Page from your teacher. Now the "=" symbol on the central line indicates that the expressions on each side of the mat are "equal."

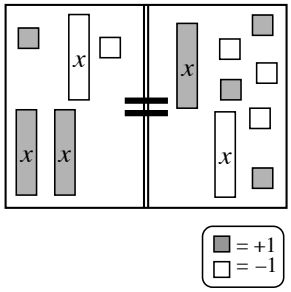


a. Build the equation represented by the Equation Mat above on your own mat using algebra tiles.

b. Record the original equation represented on your Equation Mat on your paper.

c. Simplify the tiles on the mat as much as possible. Record what is on the mat after each legal move as you simplify each expression. What value of x will make the expressions equal?

6-76. Amelia wants to solve the equation shown on the Equation Mat at right. After she simplified each expression as much as possible, she was confused by the tiles that were left on the mat.



a. What was Amelia's original equation?

b. Remove any zero pairs that you find on each side of the Equation Mat. What happens?

c. What is the solution to this equation? That is, what value of x makes this equation true? Explain your **reasoning**.

6-77. Amelia now wants to solve the equation $2x + 2 + (-3) = 5x + 8$. Help her find the value of x that makes these expressions equal. Be sure to:

- Build the expressions using algebra tiles on your Equation Mat.
- Draw the mat on your paper.
- Simplify the mat to help you figure out what value of x makes this equation true.

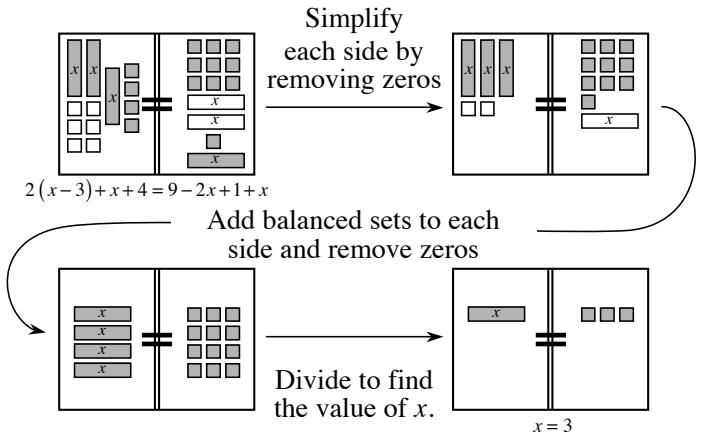
METHODS AND MEANINGS

MATH NOTES

Using an Equation Mat

An **Equation Mat** can help you visually represent an equation with algebra tiles and also assist with its solution.

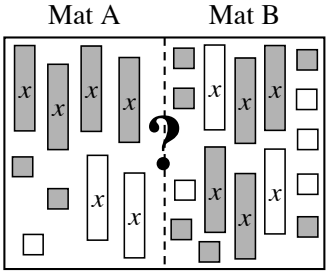
For example, the equation $2(x-3)+x+4=9-2x+1+x$ can be represented as shown on the first equation mat and then solved using legal moves to show that the solution is $x=3$.



Review & Preview

6-78. Use the legal moves that you have developed to simplify each mat and, if possible, decide which expression is greater.

a.



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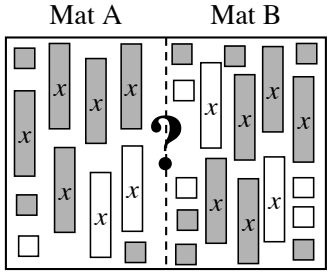


6-79. Victor wants to play "Guess My Number." Use the clues below to figure out his number. Each part is a new game.

a. "*When you double my number and subtract 9, you get my original number. What's my number?*"

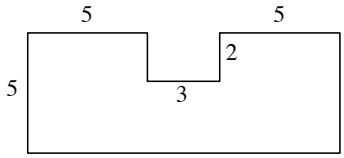
b. "*When you double my number and add 5, you get 17. What's my number?*"

6-80. To solve the following problem, use the 5-D Process. Define a variable and write an expression for each column of your chart.

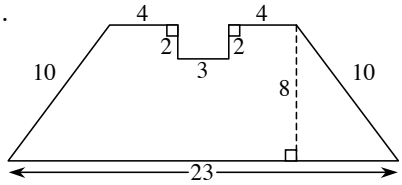
In the first three football games of the season, Carlos gained three times as many yards as Alden. Travis gained ten yards more than Carlos. Altogether the three players gained a total of 430 yards. How many yards did Carlos gain?

6-81. Find the area and perimeter of each shape below. Show your steps and work.

a. All angles are right angles.



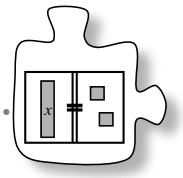
b.



6-82. Copy and complete the table. What is the rule for the table?

x	–2	4	$\frac{1}{2}$	0	7	–4
y	–7			–3	11	

6.2.2 How do I know that it is correct?



Checking Solutions and the Distributive Property

Sometimes a person's life can depend on the solution of a problem. For example, when skydiving teams jump from airplanes and aim for specific targets on the ground they need to carefully plan their speed and timing. If they are trying to land in a sports stadium as entertainment before a baseball game and they open their parachutes too soon, they may miss the landing area and crash into a building or a tree. If they jump out of the plane too soon, they may run into another skydiver. Even a small miscalculation could be dangerous.

Solving a problem is one challenge. However, once solved, it is important to have ways to know if the solution you found is correct. In this lesson you will be solving equations and finding ways to determine if your solution makes the equation true.

6-83. Chen's sister was making a riddle for him to solve, *"I am thinking of a number. If you add two to the number then triple it, you get 9."*

a. Build the equation on an Equation Mat. What are *two* ways that Chen could write this equation?

b. Solve the equation and show your work by writing the equation on your paper after each legal move.

c. When Chen told his sister the mystery number in the riddle she said he was wrong. Chen was sure that he had figured out the correct number. Find a way to **justify** that you have the correct solution in part (c).

6-84. Now solve the equation $4(x+3)=8$. Remember to:

- Build the equation on your Equation Mat with algebra tiles.
- Simplify the equation using your legal moves.
- Record your work on your paper.
- Solve for x. That is, find the value of x that makes the equation true.

6-85. CHECKING YOUR SOLUTION

When you solve an equation that has one solution, you get a value of the variable. But how do you know that you have done the steps correctly and that your answer "works"?

a. Look at your answer for problem 6-84. How could you verify that your solution is correct and convince someone else? Discuss your ideas with your team.

b. When Kelly and Madison compared their solutions for the equation $2x - 7 = -2x + 1$, Kelly got a solution of $x = 2$ and Madison got a solution of $x = -1$. To decide if the solutions were correct, the girls decided to check their answers to see if they made the expressions equal.

Finish their work below to determine if either girl has the correct solution.

Kelly's Work	Madison's Work
$2x - 7 \stackrel{?}{=} -2x + 1$	$2x - 7 \stackrel{?}{=} -2x + 1$
$2(2) - 7 \stackrel{?}{=} -2(2) + 1$	$2(-1) - 7 \stackrel{?}{=} -2(-1) + 1$

c. When checking, Kelly ended up with $-3 = -3$. Does this mean that her answer is correct or incorrect? And if it is correct, does this mean the solution is $x = -3$ or $x = 2$? Explain.

d. Go back to problem 6-84 and show how to check your solution for that problem.

6-86. Kelly solved the equation $4(x + 3) = 8$ from problem 6-84. Her work is shown at right.

$$\begin{aligned} 4(x+3) &= 8 \\ x+3 &= 2 \\ x+3+(-3) &= 2+(-3) \\ x &= -1 \end{aligned}$$

a. If $4(x + 3) = 8$, does $x + 3$ have to equal 2? Why?

b. What did Kelly do to remove the 3 unit tiles from the left side of the equation? Does this move affect the equality?

c. If Kelly were solving the equation $3(x - 5) = 9$, what might her first step be? You may want to build this equation on an Equation Mat to help make sense of her **strategy**.

6-87. Now practice this new solving skill by building the equation with tiles, solving for x, and checking your solution for each equation. Record your work.

a. $4(x+1)+1+(-x)=10+x$

b. $-1+2x-x=x-8+(-x)$

c. $5+2(x-4)=4x+7$

d. $9-3x=1+x$

e. $3x+3-x+2=x+5$

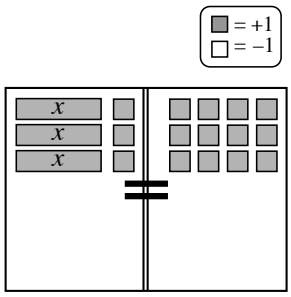
f. $4=3(2x+1)-11$

6-88. Show the check for each of these problems and decide if the solution is correct or incorrect.

a. $5x+8=3x-2$ Solution: $x=-5$

b. $2(x+1)+6=20-3x$ Solution: $x=4$

6-89. Consider the Equation Mat at right.



a. Write the original equation represented.

b. Simplify the tiles on the mat as much as possible. What value of x will make the two expressions equal?

6-90. When Lakeesha solved the equation $3(x+1)=12$ from problem 6-89, she **reasoned** this way:

"*Since 3 groups of* $(x+1)$ *equals 3 groups of 4, then I know that each group of* $(x+1)$ *must equal 4.*"

a. Do you agree with her **reasoning**? Explain.

b. How can the result of Lakeesha's **reasoning** be written?

c. Verify that your answer from problem 6-89 will make the equation you wrote in part (b) true.

6-91. During this chapter, you will use your new solving skills to solve word problems. Think about and use the **strategies** you already have to answer the questions below.

a. Andy is 4 years older than Eduardo. If Andy is x years old, write an expression to represent Eduardo's age.

b. In Eduardo's collection, the number of butterflies is 12 more than twice the number of moths. If there are x moths, write an expression to represent the number of butterflies he has.

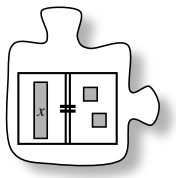
6-92. The class advisor was helping students plan an end-of-the-year trip. The students were surveyed regarding their choices. The results are in the circle graph at right.

a. What percentage of the students chose the water park?

b. Which two results are very close?

c. Write a recommendation to the class advisor regarding what the next step would be?

6.2.3 How can I record it?



Solving Equations and Recording Work

In this lesson, you will continue to improve your skills at simplifying and solving more complex equations. You will develop ways to record your solving **strategies** so that another student can understand your steps without seeing your Equation Mat. Consider the following questions as you work today.

How can I record the steps I use to solve?

How can I record what is on the Equation Mat after each step?

6-93. Gene and Aidan were using the algebra tiles to solve equations. Aidan was in the middle of a problem when he was called away. Gene picked up Aidan's paper, but he had a hard time figuring out what he should do next.

Help Gene by completing his table on the Lesson 6.2.3 Resource Page.

Mat A	**Mat B**	**Steps taken**
$2x + 2(2x + 1) + (-3x) + (-6)$	$4x + 3 + (-3) + x + 8$	Original Equation
		1. Distributive Property
$3x + (-4)$	$5x + 8$	2.
		3. Subtract $3x$ from both sides
-12	$2x$	4.
		5. Divide both sides by 2

6-94. Aidan was frustrated that he needed to write so much when solving an equation. He decided to come up with a shortcut for recording his work to solve a new equation.

As you look at Aidan's recording of how he solved $2x + 4 = -12$ below, **visualize** an Equation Mat with algebra tiles. Then answer the questions for each step below.

$$2x + 4 = -12$$
$$-4 \quad = -4$$
$$\frac{2x}{2} = \frac{-16}{2}$$
$$x = -8$$

a. What legal move does writing -4 twice represent?

b. What legal move does circling the $+4$ and the -4 represent?

c. What does the box around the $\frac{2}{2}$ represent?

d. Why did Aidan divide both sides by 2?

e. Check Aidan's solution in the original equation. Is his solution correct?

6-95. The method of recording the steps in the solution of an equation is useful only if you understand what operations are being used and how they relate to the legal moves on your Equation Mat.

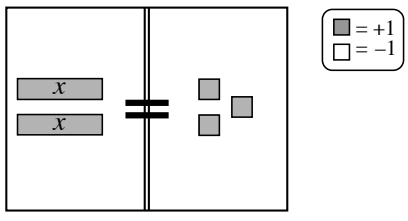
Find the work shown at right on your resource page for this lesson.

$$x + (-4) + 6x = 3x - 1 + 5$$
$$-4 + 7x = 3x + 4$$
$$7x = 3x + 8$$
$$4x = 8$$
$$x = 2$$

a. For each step in the solution, add the missing work below each line that shows what legal moves were used. You may want to build the equation on an Equation Mat.

b. Check that the solution is correct.

6-96. Gene is confused. He simplified an equation and ended up with the mat shown at right. What is the value of x?



6-97. For each equation below, solve for x. You may build the equation on your Equation Mat. Record your work in symbols using Aidan's method (problem 6-94). Remember to check your solution.

a. $-2x+5+2x-5=-1+(-1)+6x+2$

b. $3(4+x)=x+6$

c. $5x+(-x)-1=11-2x$

d. $3(-x+2)+x-1=-x-3$

6-98. LEARNING LOG

In your Learning Log, explain what it means to solve an equation. What is a solution? Be sure to give an example. Title this entry "Solving Equations and Finding Solutions" and include today's date.

METHODS AND MEANINGS

Checking a Solution

MATH NOTES

To check a solution to an equation, substitute the solution into the equation and verify that it makes the two sides of the equation equal.

For example, to verify that $x=10$ is a solution to the equation $3(x-5)=15$, substitute 10 into the equation for x and then verify that the two sides of the equation are equal.

As shown at right, $x=10$ is a solution to the equation $3(x-5)=15$.

$$3(10-5)\stackrel{?}{=}15$$
$$3(5)\stackrel{?}{=}15$$
$$15=15$$

✓ *True, so x = 10 is a solution.*

What happens when you do this check if your answer is incorrect? For example, try substituting $x=2$ into the same equation. The result shows that $x=2$ is not a solution to this equation.

$$3(2-5)\stackrel{?}{=}15$$
$$3(-3)\stackrel{?}{=}15$$
$$-9\neq 15$$

✗ *Not true, so x = 2 is not a solution.*

Review & Preview

6-99. Solve each equation below for x. Check your final answer.

a. $4x = 6x - 14$ b. $3x + 5 = 50$

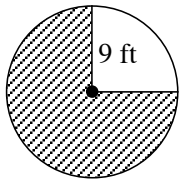
6-100. Examine the table below.

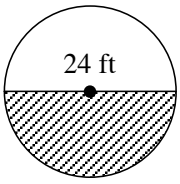
x	0.5	0	2	4	5
y	−0.5	−2	4	10	13

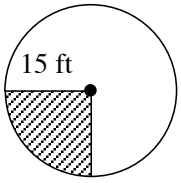
a. What is the rule for the table?

b. Explain the **strategy** you used to find the rule.

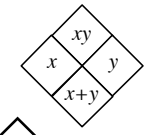
6-101. Find the area of each shaded **sector** (region) in the circles below. Note that the smaller angles in parts (a) and (c) are 90° angles.

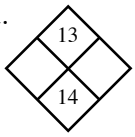
a. 

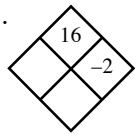
b. 

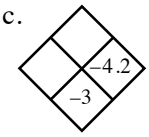
c. 

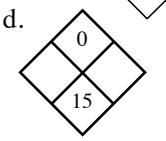
6-102. Copy and complete each of the Diamond Problems below. The pattern used in the Diamond Problems is shown at right.



a. 

b. 

c. 

d. 

6-103. A cattle rancher gave $\frac{1}{3}$ of his land to his son and kept the remaining $\frac{2}{3}$ for himself. He kept 34 acres of land. How much land did he have to begin with?

6.2.4 How can I represent it?

Using a Table to Write Equations from Word Problems

In the last few lessons you used algebra tiles and Equation Mats to solve problems where variables represented specific numbers. Those tools are related to the processes you have used to solve word problems where a specific value is unknown. Today you will connect these two tools and the expressions you wrote using a part of the 5-D Process to extend your repertoire for solving problems.

6-104. THE 5-D PROCESS REVISITED

Use the 5-D Process to set up the following problem. Complete only *three* trials. Even if you do not yet know the solution, wait for your teacher's instructions.

The Great Lakes contain the largest amount of fresh water on the surface of the planet. Combined, the five lakes (Superior, Michigan, Huron, Erie, and Ontario) contain 84% of North America's and 21% of the world's surface fresh water!

The amount of water in Lake Superior is 1720 cubic miles more than the amount of water in Lake Michigan. Lake Huron has 330 cubic miles of water less than Lake Michigan. If the total amount of water in the three lakes is 4,930 cubic miles, how much water is in Lakes Huron, Michigan, and Superior?

6-105. GO FOR THE GOLD

As you saw in problem 6-104, sometimes organizing your thinking using the 5-D Process to solve a word problem involves a lot of work. Sometimes the tables are very complicated or the numbers require many trials to find the answer. How can your new equation solving skills help you solve word problems? Read the following word problem and then answer the questions below.

While looking at the country of Jamaica's results from the 2008 Beijing Olympics, Gemma noticed that the number of gold medals Jamaica received was twice the number of silver medals. She also realized that Jamaica received 1 fewer bronze medal than silver medals. Altogether, Jamaica received 11 medals.

a. Gemma started by setting up the 5-D Process table below. What did she define x to represent?

Define			**Do**	**Decide**
# Gold	# Silver	# Bronze	Total Number of Medals	11?
$2x$	x	$x-1$		

b. How did she represent the number of gold and bronze medals?

c. Write an equation for the total number of medals.

d. Solve your equation in part (c). What is the value of x? What does this represent?

e. How many gold medals did Jamaica earn? Explain how you know.

6-106. Solve the following word problems by writing and solving an equation. You may choose to use the 5-D Process and create a table to help you build your equation. It may be helpful to first do one or two trials with numbers to help establish a pattern. Whatever **strategy** you use, do not forget to define the variable. Check your answer.

a. A person's height is positively correlated to their arm span (the distance between the ends of your fingertips as your arms are held out on each side of your body). One of the tallest men in history had an arm span that measured 7 inches more than his height. The combined total of his arm span and height was 221 inches. How tall was this man?

b. Have you ever tried to hold your breath? Humans can only hold their breath an average of one minute. However, other animals can hold their breath for much longer.

A Greenland whale can hold its breath three times as long as a beaver and a hippopotamus can hold its breath five minutes less than a beaver. If you added the time a Greenland whale, beaver, and hippopotamus can hold their breath, you would get 95 minutes! How long can a beaver hold its breath?

6-107. LEARNING LOG

In Chapter 3 you learned about variables and using the 5-D Process to solve problems. In Chapter 5 you simplified expressions using algebra tiles and in this chapter you focused on solving equations.

In your Learning Log describe how variables and equations can be used to solve word problems. Use an example problem to help make your explanation clear. Title this entry, "Using the 5-D Process to Write and Solve Equations," and label it with today's date.

METHODS AND MEANINGS

MATH NOTES

Defining a Variable

When you write an equation, it is important to define your variable carefully. You need to be clear about what you are talking about so that someone else looking at your work understands what the variable represents. This step is an important habit to develop because it is an important step in solving many different math problems.

Suppose you have the problem:

> At the neighborhood grocery store, grapes cost \$3 a pound. If Belinda spent \$5.40 on grapes, how many pounds of grapes did she buy?

One equation you could write would be $3x = 5.4$, if you know what x stands for. The variable x should be clearly defined, such as $x =$ pounds of grapes, rather than just $x =$ grapes. You could also write $g =$ pounds of grapes, since any letter may be used as a variable.

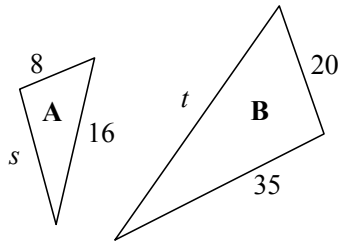
Review & Preview

6-108. Consider the equation $7 = 3x - 5$.

a. Stanley wants to start solving the equation by adding five to both sides, while Terrence wants to first subtract seven from both sides. Will both **strategies** work? Is one **strategy** more efficient than the other?

b. Solve $7 = 3x - 5$. Show your steps.

6-109. The two triangles at right are similar shapes.

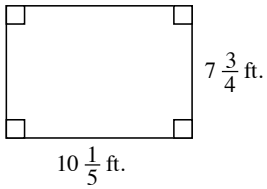


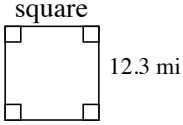
a. What is the scale factor between shape A and shape B?

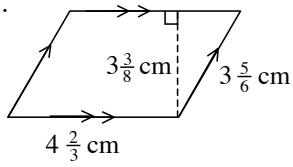
b. Find the missing sides.

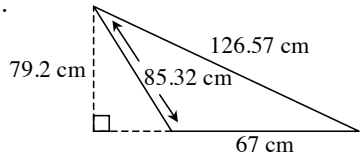
c. If you wanted to make shape A smaller instead of bigger, what is a scale factor you could use?

6-110. Find the area and perimeter of the following figures.

a. 

b. square 

c. 

d. 

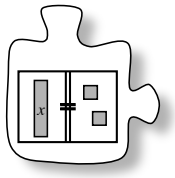
6-111. Graph the following points on a coordinate grid: $(1,1)$, $(4,1)$, and $(3,4)$.

Connect the points, then translate the points three units right and three units up. What are the coordinates of the vertices of the new triangle?

6-112. Find the value of the expression $2x+6$ for the given values of x.

a. $x=6$ b. $x=-2$ c. $x=0$ d. $x=5$

6.2.5 How can I model it?



Writing and Solving Equations

Engineers investigate practical problems to improve people's quality of life. To investigate solutions to problems they often build models. These models can take various forms. For example, a structural engineer designing a bridge might build a small replica of the bridge. Civil engineers studying the traffic patterns in a city might create equations that model traffic flows into and out of a city at different times.

In this lesson you will be building equations to model and solve problems based on known information. As you work today keep the following questions in mind:

What does x represent in the equation?

How does the equation show the same information as the problem?

Have I answered the question?